**Answers: Chapter 32**

**Matching**

1. f  
2. p  
3. m  
4. d  
5. n  
6. c  
7. i  
8. b  
9. j  
10. e  
11. s  
12. k  
13. g  
14. q  
15. o  
16. l  
17. a  
18. r  
19a. slow  
19b. fast  
20. higher

**Image Labeling**

1. pixel  
2. voxel  
3. X and Y are the planes in the ROI  
4. sagittal  
5. transverse  
6. coronal  
7. 2-D images  
8. fetal heart beat  
9. STIC process  
10. volume loop

**Multiple Choice**

1. c  
2. a  
3. c  
4. d  
5. b  
6. d  
7. b  
8. d  
9. c  
10. b  
11. b  
12. d  
13. a  
14. c  
15. b  
16. c

**Fill-In-The-Blank**

1. volume  
2. 3-D  
3a. remote  
3b. diagnostic  
4a. faster  
4b. smaller  
5. Mechanical  
6a. acquisition  
6b. storage  
7. ROI  
8. carry over  
9. complimentary  
10. orthogonal  
11. coronal  
12a. bony  
12b. facial  
13. VOCAL  
14. live or real-time 3-D  
15a. flat  
15b. voxel  
16. multiplanar reconstruction (MPR)  
17. time  
18. spatial

1. Measurements such as head and abdominal circumference, biparietal diameter, and femur length do not reflect the soft tissue mass that accounts for much of the variation in newborn body composition and weight. Incorporating soft tissue mass into the equation for calculating fetal weight may lead to more accurate predictions of birth weight. VOCAL software determining thigh volume may calculate fetal weight accurately because the thigh volume accounts for 46% of the variation in body composition, whereas traditional biometric parameters for fetal weight estimation accounted for only 4% to 14% in newborns.

2. Parents look forward to having a visual confirmation of the pregnancy, “meeting the baby,” and receiving reassurance of normalcy. Parents and even their families look forward to the bonding experience the sonographic exam provides. Studies have reported that 2-D sonography decreases patient anxiety and can even contribute to positive maternal health behaviors such as encouraging mothers to give up smoking. A few studies have suggested that 4-D images of the fetus provide the parents with more positive feelings about the experience because the images are more realistic and recognizable. Some believe that because the images appear more lifelike, the parents could form a tighter bond and create stronger positive emotions.

3. Volumes/data sets can be manipulated on the scanner itself or offline/remotely with special equipment at any time after the acquisition. If questions arise regarding a study with saved volumes, data can be reviewed, manipulated, and reported on.

4. DICOM (digital imaging and communications in medicine) is a collaborative effort that created universal codes for storing and communicating medical information safely regardless of vendor brand. The DICOM standard is what allows images from ultrasound scanners of different manufacturers to be viewed and stored on a PACS system from a different vendor. A DICOM standard for 3-D ultrasound data sets is not available, and therefore, most PACS workstations do not accept 3-D ultrasound volumes.

5. VOCAL can be used to more accurately measure the volume of the fetal lungs evaluating for pulmonary hyperplasia. Volume measurements have also been reported for the placenta, amniotic cavity, fetal brain, and liver.
IMAGE EVALUATION/PATHOLOGY

1. The study demonstrates tomographic ultrasound imaging. The upper left image displays parallel lines spaced through the entire transverse view, which represent the spatial relationship and distance between the sagittal image slices displayed. Spacing, which is selected by the operator, determines how much of an anatomic region is revealed and the distance between each image.

2. Image A is a surface rendered image using a low threshold on the fetal face, which was obtained in a sagittal plane. Few echoes were eliminated, allowing for visualization of the facial skin. The underlying bony structure is not seen. Note images A and B are identical in planes A, B, and C, but display a significant difference in the multiplanar view due to raising the threshold. Increasing the threshold eliminates lower intensity echoes of the skin and highlights bony structures of the face.

3. An electronic scalpel was used to remove the placenta, umbilical cord, uterine wall, and other structures surrounding the fetus. In 3-D mode, an electronic eraser or scalpel is available to remove unwanted structures in the image. This technique is similar to editing a digital photo. The restore or initialize button will undo any changes that have been made and will return the volume to the original saved version.

4. Glass body or transparency mode is a rendering mode that is used in conjunction with power or color Doppler. This technique is useful for highlighting the vascular anatomy while still displaying the surrounding tissues. In this mode the tissue is more transparent, allowing the vessels throughout the volume to show through, making the relationship of the blood vessels to the surrounding anatomy more apparent. All grayscale data can be removed to display only the vascular anatomy to display a color Doppler image similar to an angiography. This image displays an umbilical cord with surrounding tissue completely removed.

5. A bicornuate uterus displays two separated uterine cornua on a coronal imaging plane with an external funal indentation of greater than or equal to 1 cm. A septate uterus has a septum dividing the endometrial cavity with a 1 cm or smaller notch in the fundal contour. An arcuate uterus has a normal external (myometrial) uterine contour and concave fundal indentation of the endometrial cavity of less than 1 cm. Linear measurement 2, on the image, reveals a 0.42 cm septum, categorizing the uterus as arcuate.

CASE STUDY

1. Image A demonstrates a sagittal acquisition of the fetal spine in plane A. Plane B is a transverse view, and plane C a coronal view. The multiplanar view clearly demonstrates a normal spine and posterior ribs. Note the marker dot can be moved along the spine in the sagittal view and the same vertebral body will be displayed in the B and C planes. Images B and C display the fetal skeleton in maximum mode.

2. Clubfoot, also known as talipes, is the inward turning of the foot. The formation usually involves muscle and bony anomalies. Clubfoot, image A, can be clearly demonstrated when 3-D imaging is used in the surface rendering mode with high-resolution settings. The fetus was also found to have radial club hand, which is frequently caused by a shortened radius. It is unusual to have both anomalies occur simultaneously.